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# FREQUENCY OF CARCINOGENIC SHOCK IN PATIENTS WITH NSTEMI

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## ABSTRACT

**Background:** Among the various types of acute coronary syndrome, NSTEMI has the most aggravating clinical courses. More severely, the clinical course may present as cardiogenic shock which is associated with a high burden of morbidity and mortality. Identifying the predictors of NSTEMI and the associated frequency of cardiogenic shock is of great value for diagnosis, risk stratification, and management.

**Objectives:** The intention is to assess the incidence of cardiogenic shock among patients presenting with non-ST elevation myocardial infarction (NSTEMI) and how this frequency is modified by age, sex, comorbidities, and specific clinical and biochemical factors.

**Study Design:** A cross-sectional study.

**Place and duration of study.** From 01 December 2024 to 31 May 2025 Cardiology Department Sandeman Provincial Hospital / Bolan Medical College / Hospital, Quetta.

**Methods:** A cross-sectional study was undertaken within a cardiology unit involving a cohort of 100 NSTEMI patients. For each patient, variables including data on clinical history, laboratory results, systolic blood pressure, left ventricular ejection fraction, serum creatinine level, and the presence/absence of diabetes were obtained. The definition of cardiogenic shock was based on standard hemodynamic parameters. The data were analyzed using SPSS version 24.0, with a p-value of $<0.05$ considered statistically significant.

**Results:** Among the cohort of 100 NSTEMI patients, the mean age was 58.4 years (SD 11.7 years) and the sample was composed of 62% males and 38% females. 12% of the patients presented with shock. The mean systolic blood pressure of patients with shock was 86.5 mmHg (SD 8.2 mmHg) which was significantly lower ($p = 0.001$) than the 118.4 mmHg (SD 12.6 mmHg) of the non-shock patients. The mean left ventricular ejection fraction (LVEF) was also lower in shock patients, 34.2% (SD 7.8 %) as opposed to 49.5% (SD 8.6%) in non-shock patients ($p = 0.002$).Shock was also significantly associated with diabetes mellitus ($p = 0.041$) and higher levels of creatinine ($p = 0.03$).

**Conclusion:** Cardiogenic shock presents as a complication in a notable percentage of NSTEMI cases, particularly in older, male NSTEMI patients with diabetes and renal insufficiency. Weakness of the left ventricular ejection fraction and lower systolic blood pressure were strong predictors of shock. In NSTEMI patients with hemodynamic instability, identification of such patients and immediate intervention will be critical in improving outcomes and lowering mortality.

## INTRODUCTION

Non-ST elevation myocardial infarction (NSTEMI) is an important type of acute coronary syndrome (ACS). It is defined as an irreversible myocardial injury without persistent ST-segment elevation on the ECG.NSTEMI constitutes 60–70% of all global acute coronary syndrome (ACS) hospitalizations and remains a significant source of morbidity and mortality [1]. In particular, cardiogenic shock (CS) complicates roughly 10% of cases and accounts for 5–10% of in-hospital mortality with NSTEMI [2]. The risk for developing CS during an NSTEMI is attributed to extensive ischemic myocardium, ventricular dysfunction, and arrhythmias, as well as a systemic inflammatory cascade [3]. Although estimates indicate NSTEMI CS occurs less often, it is of equal risk, if not greater to the patient, due to a delay in diagnosis and atypical presentations [4]. The prognosis and outcome of these patients can be considerably improved if the clinician is trained to recognize them early and allocate the necessary resources and interventions [5]. While advanced age, diabetes, chronic kidney disease, and history of myocardial infarction are common risk indicators for developing CS during NSTEMI, it is also accompanied by severely depressed left ventricular ejection fraction (LVEF) and hypotension as greater indicators of impending cardiac collapse [6]. In developing countries like Pakistan, these factors can be worsened due to delays in patient presentation and delays in performing immediate revascularization [7]. To improve management practices, more attention must be paid to regionally based NSTEMI studies as the widening evidence gap surrounding cardiogenic shock in NSTEMI demonstrates an inexorable trend in negative clinical outcomes. As cardiogenic shock patients can benefit from early percutaneous coronary intervention (PCI) and aggressive medical therapy, early identification and hospital preparedness determine the extent of these benefits [8]. Clinicians must understand the frequency and the predictors of cardiogenic shock in NSTEMI to take appropriate preventive action, triage critical care staff, and maximize patient outcomes. [9]. The goal of the present study is to determine the frequency of NSTEMI patients who present with cardiogenic shock, and to describe the relevant clinical and biochemical characteristics within our local context. The study hopes to promote evidence informed approaches to the prompt identification and treatment of cardiogenic shock in order to reduce the mortality and improve the prognosis of patients with NSTEMI presenting.

## METHODS

This cross-sectional study was collected over six months in the Department of Cardiology at Sandeman Provincial Hospital / Bolan Medical College / Hospital, Quetta.. A non-probability consecutive sampling technique was utilized to include 100 patients who were clinically diagnosed with NSTEMI. NSTEMI was confirmed in the patients when cardiac troponin levels were elevated and there was no sustained ST-segment elevation on the ECG. Patients were evaluated for cardiogenic shock clinically, defined as sustained systolic blood pressure <90 mmHg for 30 minutes or longer and sign of end-organ hypoperfusion. A structured pro forma was used to collect demographic data, medical history, laboratory results, and data from the echocardiograms.

### Inclusion Criteria

The study included individuals between the ages of 30 and 80 of all genders, admitted within 24 hours of symptom onset, and classified as having NSTEMI based on cardiac biomarkers and ECG changes.

### Exclusion Criteria

Patients with an incomplete workup or who left against medical advice, as well as those identified as having STEMI, valvular heart disease, myocarditis, or chronic heart failure were also excluded from analysis.

### Ethical Approval Statement

The researchers received approval from the Institutional Review Board of Sandeman Provincial Hospital / Bolan Medical College / Hospital, Quetta. CPSP/REU/CRD-2023-001-2940 Dated: November 26, 2024) Approval Committee. Informed consent was obtained from each participant. The confidentiality of all patient information was kept secure; the Declaration of Helsinki was adhered.

### Data Collection

Instruments for data collection comprised a structured questionnaire that covered demographics, comorbidities, blood pressure, laboratory results, and echocardiographic measurements. The presence of cardiogenic shock was recorded according to predefined hemodynamic criteria. Prior to statistical analysis, data were entered into the statistical software and underwent a thorough double-checking for accuracy and completeness.

**Statistical Analysis**

SPSS version 24.0 was used for data analysis. For quantitative variables (age, blood pressure, LVEF), means and standard deviations were computed while for the qualitative variables, data were presented in frequencies and percentages. The Chi-square and t-tests were used and the threshold for statistical significance was set at $p \leq 0.05$.

## RESULTS

The study involved 100 NSTEMI identified patients with an average age of 58.4 ± 11.7. Of the patients, 62% were men, and 38% were women. The overall prevalence of cardiogenic shock was 12%. Shock patients had a mean systolic blood pressure of 86.5 ± 8.2 mmHg, distinctly lower than the 118.4 ± 12.6 mmHg recorded for non-shock patients (p = 0.001). The shock group also had significantly lower mean LVEF (34.2 ± 7.8%) compared to 49.5 ± 8.6% in the non-shock group (p = 0.002). There was a higher proportion of patients with diabetes mellitus in the shock group (58%) compared to the non-shock group (30%) (p = 0.041). Additionally, shock patients more commonly had elevated serum creatinine > 1.5 mg/dL with 46% of the shock patients as opposed to 18% of the non-shock patients (p = 0.03). A history of myocardial infarction was more prevalent in the shock patients 50% vs 21% (p = 0.031).

**Table 1. Baseline Demographic Characteristics of Patients (n = 100)**

| Variable | Cardiogenic Shock (n = 12) | No Shock (n = 88) | p-Value |
|---|---|---|---|
| **Mean Age (years)** | 58.4 ± 11.7 | 57.9 ± 10.8 | 0.81 |
| **Gender (Male %)** | 9 (75%) | 53 (60%) | 0.29 |
| **Female %** | 3 (25%) | 35 (40%) | 0.29 |
| **Hypertension %** | 7 (58%) | 48 (55%) | 0.82 |
| **Smoking %** | 5 (42%) | 30 (34%) | 0.56 |
| **Family History of CAD %** | 4 (33%) | 25 (28%) | 0.72 |

**Table 2. Clinical and Hemodynamic Parameters**

| Parameter | Cardiogenic Shock (n = 12) | No Shock (n = 88) | p-Value |
|---|---|---|---|
| **Systolic BP (mmHg)** | 86.5 ± 8.2 | 118.4 ± 12.6 | **0.001** |
| **Diastolic BP (mmHg)** | 54.3 ± 7.1 | 74.5 ± 9.3 | **0.002** |
| **Heart Rate (beats/min)** | 108 ± 14 | 89 ± 12 | **0.014** |
| **LVEF (%)** | 34.2 ± 7.8 | 49.5 ± 8.6 | **0.002** |
| **Killip Class ≥ III %** | 10 (83%) | 22 (25%) | **< 0.001** |

**Table 3. Biochemical and Comorbidity Profile**

| Variable | Cardiogenic Shock (n = 12) | No Shock (n = 88) | p-Value |
|---|---|---|---|
| **Diabetes Mellitus %** | 7 (58%) | 26 (30%) | **0.041** |
| **Chronic Kidney Disease %** | 4 (33%) | 8 (9%) | **0.03** |
| **Serum Creatinine > 1.5 mg/dL %** | 6 (46%) | 16 (18%) | **0.03** |
| **Previous Myocardial Infarction %** | 6 (50%) | 19 (21%) | **0.031** |
| **Hyperlipidemia %** | 5 (42%) | 27 (31%) | 0.42 |

**Table 4. Outcomes and Hospital Course**

| Outcome Variable | Cardiogenic Shock (n = 12) | No Shock (n = 88) | p-Value |
|---|---|---|---|
| **Use of Inotropes %** | 11 (92%) | 22 (25%) | **< 0.001** |

| | | | |
|---|---|---|---|
| **Mechanical Ventilation %** | 8 (67%) | 10 (11%) | **< 0.001** |
| **ICU Stay (days)** | 5.8 ± 2.3 | 2.4 ± 1.1 | **0.001** |
| **In-Hospital Mortality %** | 4 (33%) | 3 (3%) | **0.001** |

## DISCUSSION

Of the hundred NSTEMI patients in this single-center cohort, 12% had cardiogenic shock (CS), which is consistent with the current 5-10% range in patients with complications following acute MI.Even with the advancements in health care, CS still carries a 40% short-term mortality rate, which has not declined in recent years [10]. The majority of acute MI-CS incidents are in STEMI, but NSTEMI can and does cause similarly severe mortality, more often owing to the concentrated advanced and obstructive coronary disease, the delay in recognition, and the complex disease of the coronary circulation. This has been documented in multiple registries and in systematic reviews and meta-analyses [11,12]. The recent European guidance focuses on the rapid identification, early invasive assessment, and escalated staged support of shock in ACS, a consistent theme for both STEMI and NSTE-ACS pathways, with particular differences in the revascularization approach. The combination of lower systolic blood pressure and shock, along with lower LVEF, corresponds with prior findings of hypotension, systolic dysfunction, renal failure, and prior MI as determinants of cardiogenic shock and its mortality [13]. An independent multicenter study spotlighted evolving renal failure, leukocytosis, and the use of multiple vasopressors as short-term mortality predictors in CS, which reflects on our finding of elevated creatinine in the shock population [14,15] In Eastern Europe during wartime, efforts to revascularize off continental Europe found acute MI-CS mortality to be more than 50%. This stated mortality rate illustrates the need for the integration of systems and the rapid accessibility of reperfusion. The study reported that while immediate multivessel PCI has been shown to improve outcomes, performing culprit-only PCI actually presents a lower risk of the composite outcome of death or renal replacement therapy at 30 days, with results that continued to remain beneficial at 1 year. [16]This led guideline organizations to recommend performing acute PCI on only the infarct-related artery in CS with multivessel disease and to developmental staged revascularization. It is important to note that while CULPRIT-SHOCK mostly included STEMI, the NSTE-ACS patients who were included, and the same principle of NSTEMI-CS can be used due to the same hemodynamic jeopardy and risk of contrast-induced acute kidney injury. Professional society provided comprehensive trial synopses and summaries, which consolidated and standardized practice in shock centers. The use of Mechanical circulatory support (MCS) is still contentious [17]. Due to a lack of significant mortality benefit within the first 30 days and up to 6 years after balloon pump implantation in AMI-CS, the IABP-SHOCK II trial led to a major de-emphasis on routine intra-aortic balloon pump use [18]. Recent guidelines recommend selective use of MCS (for example, percutaneous LV support or VA-ECMO) within multidisciplinary shock teams based predominantly on invasive hemodynamics and 'shock staging', but the availability of high quality randomized controlled evidence, especially in NSTEMI-CS, remains sparse. The cohort's documented necessity of inotropes, mechanical ventilation, and days in the ICU for patients presenting with shock is consistent with the contemporary 'intensity of care' the literature describes and points to the toll on resources that circulatory shock the syndrome presents. The extent of coronary and systemic atherosclerosis affects risk as well. With AMI-CS, polyvocal disease has been associated with a complicated in-hospital course and negatively impacts outcomes. In NSTEMI-CS this is particularly salient as it is characterized by multivessel ischemia in addition to supply-demand mismatch [19,20].

## CONCLUSION

A considerable proportion of NSTEMI patients encounter cardiogenic shock, especially when correlated with hypotension, reduced left ventricular ejection fractions, diabetes, and renal insufficiency. Assessing risks as early as possible, in conjunction with early identification and robust NSTEMI interventions, is crucial for enhancing survival rates.

**Limitations**
The potentially narrow scope of the center and the range of participants are limitations that affect the generalizability of the findings. Additionally, not including long-term follow-up, not addressing possible confounding factors such as previous medication usage, angiographic data, and the lack of follow-up are other limitations of this study. Robust validation of these findings would necessitate a multicenter approach and a larger population for the study.

**Future Findings**
Multicentric prospective studies focusing on predictive biomarkers and early NSTEMI-associated cardiogenic shock intervention studies should be emphasized in future research. Understanding and clinical integration will be further enhanced by studies that incorporate advanced hemodynamic monitoring, the timing of revascularization, and the outcomes of mechanical circulatory support.

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Concept & Design of Study: **Noor Ali**
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